STANDARD OPERATING PROCEDURE 7

Archaeological Site Boundaries

Scope and Application

The boundaries of archaeological sites (shell midden) will be evaluated within Little Squalicum Park. There is one known site located upstream of the railroad bridge, in the lower reach of the creek. The following SOP will be followed by Integral and its subcontractor Dr. Gary Wessen during this investigation.

Equipment Required

- Shovel
- Screen box with ¼ inch mesh
- Pin flags
- EDM or 30 meter tape
- Hand-held GPS Receiver
- Camera
- Decontamination equipment (SOP-10)

Procedures

1. Careful visual inspection of all available horizontal and vertical exposures.
2. Establish the extent of the presently visible cultural materials and mark the boundaries of this area with pin flags.
3. Once the latter is done, shovel testing is used to further refine our knowledge of the site's boundaries. (Washington State law forbids the knowing disturbance of an archaeological site - - including any type of sample collection - - without a permit, and so this effort will be conducted without actually impacting the site.)
4. Radial transects will be established out from the marked site boundary. (Depending upon the site's size and shape, four to six transects will be established.)

5. Starting at a point 10 meters beyond the marked site boundary - - on one of the transects - - a small (i.e., 30 centimeter diameter) shovel test pit will be dug.
6. Digging will be done in 10 centimeter arbitrary levels and the sediments recovered from each level will be screened through ¼ inch mesh in order to facilitate the recognition of any cultural materials that might be present.
7. Digging will stop as soon as either potentially intact archaeological deposits or obvious glacial deposits are encountered.
8. Once the first pit is completed, additional pits will be dug at 3 meter intervals on the transect - - moving either toward or away from the site, as appropriate - - until the edge of the buried cultural deposit is located.
9. Steps 5 through 8 will be repeated on each transect.
10. When the shovel testing is completed, additional pin flags marking the extent of the buried cultural deposit will be placed and a map showing the distribution of both the exposed materials and the buried deposits will be prepared.
11. The site are will be photographed and its location recorded with a hand-held GPS receiver in both UTM and State Plane coordinates.
12. At the completion of the effort, all of the shovel test pits will be backfilled and all pin flags will be removed from the area. Wooden stakes or equivalent may be driven along the boundaries of each site for future reference.
13. Decontaminate sampling equipment in accordance with SOP-10.
14. Document activities in site logbook.

STANDARD OPERATING PROCEDURE SOP-8

Hydrocarbon Field Screening for Soil and Sediment

Scope and Application

This SOP presents the qualitative field screening methods for hydrocarbons in soil and sediments.

Equipment and Reagents Required

- Clean stainless steel or plastic pan
- Camera
- Ziploc® bags
- Photo ionization detector (PID) or flame ionization detector (FID)

Procedures

Headspace Field Screening

1. Calibrate PID/FID in accordance with the manufacturer's specifications.
2. Label Ziploc® bag with the sample number.
3. Place representative soil/sediment sample in Ziploc® bag until bag is approximately one-half full. Seal Ziploc® bag and homogenize sample.
4. Allow bag to sit at ambient temperature for approximately 10 minutes. Place PID/FID wand into bag, being careful not to contact soil/sediment with probe.
5. Shake Ziploc® bag and record highest sustained reading in the field logbook.

Visual Screening

Visual screening consists of inspecting the soil/sediment for the presence of stains indicative of residual petroleum hydrocarbons. Visual screening is generally more effective in detecting the presence of heavier petroleum hydrocarbons, such as motor oil, or when hydrocarbon concentrations are high.

1. Visually inspect soil/sediment sample.

2. Indications of the presence of hydrocarbons typically include a mottled appearance or dark discoloration of the soil/sediment.

3. Record observations in logbook. Note: Visual observations do not definitively indicate the presence of hydrocarbons.

Sheen Screening

Sheen testing involves immersion of the soil/sediment sample in water and observing the water surface for signs of sheen.

1. A representative soil/sediment sample is placed into a clean stainless steel or plastic pan filled with deionized water with as little disturbance as possible.

2. Record observations in the logbook. Visual evidence of a sheen forming on the surface of the water is classified as follows:

   No sheen (NS)--No visible sheen on the water surface

   Colorless Sheen (CS)--Light, nearly colorless sheen; spread is irregular, not rapid; film dissipates rapidly (Note: light colorless sheens can be confused with sheens produced by organic content). Note that this sheen may or may not indicate the presence hydrocarbons.

   Heavy Sheen (HS)--Light to heavy colorful film with iridescence; stringy, spread is rapid; sheen flows off the sample; most or all of water surface is covered with sheen

Note: Samples used for field screening shall not be used for other analyses.

STANDARD OPERATING PROCEDURE SOP-9

Shipping and Handling of Samples

Equipment and Reagents Required

- Sampling and Analysis Plan (SAP)
- Site logbook
- Sample logs
- Sample labels
- Indelible black ink pens
- Ziploc® bags
- Cooler
- Blue Ice® or other ice packs
- Strapping tape or duct tape
- Chain of custody forms
- Custody seals
- Bubble wrap, newspaper, or other packing material

Procedures

NOTE: Before packaging, all samples will be individually labeled and noted in the site logbook by the sampler. Labels will be completed with all required information (refer to SAP). The samples will be assigned individual numbers that describe sample type and sample location. The sample numbers will be used to complete the chain-of-custody forms and track the samples.

Samples to be hand-delivered to the laboratory:

1. Place each sample in a plastic Ziploc® bag and align the label so it can be easily read. Seal the bag.
2. Place individual samples into the cooler so that each container is safely secured.
3. Include enough (four or more) ice packs to maintain a temperature of 4ºC or lower.
4. Complete a chain-of-custody form for the containers and seal in a Ziploc® bag.

5. Tape bag containing the chain-of-custody form to the inside of the cooler lid. Always transport the cooler together with its accompanying chain-of-custody form.
6. Close and latch cooler and affix signed custody seals over the edge of the lid and the top of the cooler body at front and rear.
7. Deliver samples to the laboratory and obtain a signed copy of the chain-of-custody form for tracking purposes.

Samples to be shipped to the laboratory:

1. Place each sample in a plastic Ziploc® bag and align the label so it can be easily read. Seal the bag.
2. Wrap each sample with bubble wrap, newspaper, or other packing material.
3. Place individual samples into the cooler so that the addition of Blue Ice® and/or packing materials will prevent significant movement of samples during shipping. Keep in mind that we cannot predict in what position the cooler will be shipped. Each container has clearance on all sides.
4. Fill the void spaces with ice packs, bubble wrap, newspaper, or other packing material to ensure samples do not break during shipment.
5. Cover the head space inside the cooler with ice packs.
6. Tape bag containing the chain-of-custody form to the inside of the cooler lid. Remember to remove the last copy of the form for tracking purposes.
7. Close and latch cooler, and wrap cooler and lid with at least two turns of strapping, duct, or packaging tape. Affix signed custody seals over the edge of the lid and the top of the cooler body at front and rear.
8. Label coolers with up arrows and information to comply with Department of Transportation requirements.
9. Notify the laboratory approximately when and how many samples will arrive. The samples must be kept under refrigeration (or packed with ice) between sampling and analysis.

Note: If samples are to be stored overnight before shipping, they must be secured in a locked room or other inaccessible area. The cooler should be sealed with a signed and dated custody seal. Before shipping, the Blue Ice® in the cooler should be replaced and the cooler resealed according to the instructions in this SOP. Samples may be shipped in coolers or any other sturdy, water-tight, appropriate container. This SOP refers to coolers for simplicity and because they are the most common type of transport container.

STANDARD OPERATING PROCEDURE SOP-10

Equipment Decontamination

Scope and Application

This SOP describes procedures for decontamination of sampling equipment, drilling equipment and other tools that could come in contact with contaminated media (Ecology 2003, PSEP 1997). Personnel performing the decontamination procedures will wear protective clothing as specified in the site-specific Health and Safety Plan.

Equipment and Reagents Required

- Plastic sheeting
- Steam cleaner and collection basin (if required)
- 55-gallon drums (if required)
- Non-phosphate detergent (e.g., Alconox or Liquinox).
- Acid Rinses (inorganic constituents) shall be reagent grade diluted nitric or hydrochloric acid (if required)
- Solvent Rinses (organic constituents) shall be pesticide grade methanol, hexane, isopropopanol or acetone (if required)
- Deionized or distilled water rinse available from retail stores. Note that distilled water generally contains low levels of organic contaminants and can not be used for field blanks (must receive reagent-grade from laboratory).
- Tap water rinse from local tap water.
- 5-gallon buckets, or other appropriate containers
- Scrub brushes
- Teflon squirt bottles
- Gloves (e.g., nitrile or polyethylene)
- Personal protective clothing

Procedures

Drill Rig or Test Pit Sampling Equipment Decontamination Procedures

1. Decontaminate sampling equipment before use, between samples and stations, and upon completion of sampling operations.

2. Equipment used during drilling/test pit operations should be decontaminated in the Exclusion Zone prior to transport to the Support Zone (refer to HASP).

3. If the steam cleaning location is in an area outside of the Exclusion Zone, remove loose sediment on the drill rig, augers, drill pipe and rods, and other large equipment at the drill site, then move the equipment directly to the steam cleaning decontamination area for more thorough cleaning.

4. To decontaminate a drill rig or backhoe, pressure wash with a steam cleaner using potable water rinse upon mobilization, between drilling locations, and upon demobilization. Cleaning water can be allowed to drain directly on the ground near the station.

5. To decontaminate auger, drill rods, and other downhole tools, pressure wash with a steam cleaner and potable water rinse upon mobilization, between drilling locations, and upon demobilization.

6. To decontaminate split-spoon and hand-auger samplers, wash with laboratory-grade detergent/water solution, rinse with tap water and a final distilled water rinse. If the samplers were exposed to visibly contaminated sediments (e.g. creosote, diesel, etc), include a methanol rinse followed by a hexane rinse. The hexane rinse would be followed by another distilled water rinse. To the extent possible, allow to air dry prior to sampling. If the split-spoon is not used immediately, wrap it in aluminum foil.

Decontamination of Sampling Implements and Processing Materials

1. Decontaminate sampling implements (e.g., spoons and knives) and other processing materials such as mixing bowls and pans, before use, between samples, and upon completion of sampling operations.

2. To decontaminate sampling spoons, mixing bowls and other hand-held tools, wash using a laboratory-grade detergent/water solution, rinse with tap water, followed by distilled water or ASTM Type II Reagent-grade water. As described above, if the sediment is visibly contaminated, a hexane rinse may be necessary

following a methanol rinse to remove water. To the extent possible, allow to air dry. Once decontaminated, this equipment will be wrapped in aluminum foil to prevent contamination by airborne contaminants during transportation to the sampling site.

3. To decontaminate sampling spoons used to collect volatile organics, wash the spoon using a laboratory-grade detergent/water solution, and rinse with distilled water. Wrap the spoon in aluminum foil. The solvent rinses are eliminated in order to avoid interference with the analysis.

4. If necessary, to decontaminate wash buckets, pressure wash with a steam cleaner using a laboratory-grade detergent/water solution and potable water rinse upon mobilization, between station locations, upon demobilization, or as needed during sampling operations.

References

Ecology. 2003. Sediment sampling and analysis plan appendix. Guidance on the development of sediment sampling and analysis plans meeting the requirements of the sediment management standards (Chapter 173-204 WAC). Prepared by Washington State Department of Ecology, Olympia, WA

PSEP. 1997. Recommended guidelines for sampling marine sediment, water columns, and tissue in Puget Sound. Final report. Prepared for the Puget Sound Estuary Program, U.S. Environmental Protection Agency, Region 10, Office of Puget Sound, Seattle, WA, and Puget Sound Water Quality Authority, Olympia, WA.

STANDARD OPERATING PROCEDURE SOP-11

Quality Control Sample Preparation

Scope and Application

To establish procedures for preparation of field quality control samples collected during field investigations as described in the Sampling and Analysis Plan (SAP).

Equipment and Reagents Required

- Sample labels
- Indelible ink pens
- Master Sample Log and Chain-of-Custody Record forms
- Sample Bottles with preservatives (if required)

Procedures

The following procedures describe the preparation of various types of field quality control samples. Although general collection frequencies are given below, the type and number of quality control samples collected is dependent upon project specific requirements.

Trip Blanks

Trip blanks are 40-milliliter (40-mL) glass sample bottles (with septum lids) filled in the analytical laboratory with analyte-free water. They are shipped to the field with the empty sample coolers and stored with those bottles until they are used. One set of trip blank samples are enclosed in each sample cooler sent to the analytical laboratory which contains volatile organic compound samples for analysis. The field scientists do not open or otherwise disturb these samples except to label them with a sample number, if required, and prepare them for shipment with environmental samples. Trip blanks are analyzed for volatile organic compounds only.

Equipment Rinsates

Equipment rinsates are collected by capturing the final distilled water rinse from equipment cleaning. Decontamination procedures are detailed in SOP-10. These samples are collected during a sampling event by filling a full suite of environmental sample

containers with rinse water using the same procedures employed for collection of environmental water samples. The results are used to flag analytical data and/or assess the concentrations of analytes in environmental samples during the data validation process. Rinsate samples are analyzed for the same compounds as related environmental samples.

Field Blanks

Field blanks are collected in the field during sampling activities by filling a full suite of environmental sample containers with analyte-free or distilled water, at the field sampling location, by pouring water from analyte-free water containers directly into the sample containers. At a minimum, one field blank will be collected during each sampling event. Field blanks are analyzed for the same compounds as related environmental samples.

Field Duplicates/Splits

Duplicates or splits, except for volatile organic compound analyses, are collected, homogenized, and split at the sampling location. Volatile organic compound sediment samples are collected from the length of the sediment grab or core, and placed immediately into appropriate sample containers for packaging and shipment to the analytical laboratory. Duplicate water samples are collected simultaneously by alternately filling similar sample bottles during the collection procedure. Duplicate samples may either be submitted to the analytical laboratory as a blind sample, or may be identified to the laboratory, depending on project objectives. Duplicate environmental samples are analyzed for the same suite of analytes.

Field Replicate Samples

Field replicate samples are collected as separate samples from the same location as the initial sample collected. Unlike duplicate/split samples, they are not subsamples of one homogenous sample. They are collected and processed according to the same procedures followed for the initial sample. Similar to the field duplicates, they may either be submitted to the analytical laboratory as blind samples, or may be identified as replicate samples, depending on project objectives. Replicate environmental samples are analyzed for the same suite of analytes as the initial sample.

Water Source Blanks

Water source blanks are collected in the field during sampling activities by filling a full suite of environmental sample containers with water from the source used for decontamination and steam cleaning using the same procedures employed for collection

of environmental water samples. At a minimum, one water source blank will be collected during each sampling event (the time frame determined by the arrival of sampling personnel at a sampling area until those personnel leave for more than one day) and from each source of water used in decontamination and steam cleaning. Water source blanks are analyzed for the same compounds as the related environmental samples.